GUJARAT TECHNOLOGICAL UNIVERSITY

RUBBER TECHNOLOGY (26)
RUBBER COMPOUND & PRODUCT TESTING
SUBJECT CODE: 2162601
B.E. 6thSEMESTER

Type of course: B. E. Rubber Technology

Prerequisite: NA

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	3	6	70	20	10	20	10	20	150

Content:

Sr. No.	Course content	Total Hrs.	% Weightage
1	Importance of Testing in Rubber Industries: Introduction, Precision, Accuracy & Validity, Specimen Preparation, Standard Temperature.	4	5
2	Control & Service testing: Need for standardization-viscosity, scorch, instruments used & their calibration, optimum cure & the use of curometer.	4	5
3	Test of Natural & Synthetic Rubbers: Plasticity, Scorch & Cure rate, tack, Plasticity Retention index, Determination of Sp.Gr. ,Green Strength, Shrinkage.	4	5
	Density & Dimensions	2	5
	Short-Term Stress & Strain Properties: Hardness, Tensile Stress/Strain, Compression/Stress/Strain, Shear Stress/Strain, Flexural (Blending) Stress/Strain, Tear Test	4	6
	Dynamic Stress & Strain Properties: Rebound Resilience, Dynamic Modulus, Loss Modulus, Tan Delta, Loss Compliance, Shear Modulus (Free Vibration Methods, Forced Vibration Methods)	4	6
	Friction & Wear	2	6
	Creep, Relaxation & Set Properties	2	6
	Fatigue Property: Flex-cracking & Cut growth Tests, Heat Buildup	3	6
	Abrasion Property: by DIN Abrasion, Pieco, Angle etc.	2	6
	Cross link Density: Volume Swelling, Cross-link Density	2	6
	Electrical Tests:	4	6

	Resistance & Resistivity, Surface Charge, Electric Strength, Tracking Resistance, Permittivity & Power Factor		
	Permeability: Gas Permeability & Vapor Permeability	2	6
4	Environmental Resistance: Moist Heat & Steam Tests, Effect of Liquids, Effect of Gases, Weathering, Biological Attack, Fire, Radiation.	3	5
5	Aged Property: Air Ageing, Heat Ageing & Oil Ageing	3	5
	Weathering Trials: Introduction, Materials, Characterization, Specimen Preparation Trial Aspects, Exposure, Angle of Exposure, Withdrawal Intervals, Meteorological Data, Evaluation.	3	5
	Age Weathering Procedures: Sun-Concentrating Devices, Exposure under Stress	3	5
6	Weathering-Environmental Correlation: Short term-One Site, Long term-Multisite	3	6

Suggested specification table with marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
12	12	16	15	15	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Physical Testing of Rubber By: R.P. Brown
2. Rubber Engineering by Indian Rubber Institute
3. ASTM Standards for Rubbers and Rubber products

Course outcome:

After learning the content of the subject the students will be able to:

1. Able to learn about importance of testing in rubber industries..
2. Understand the importance of calibration and need for standardization .
3. Learn about the Short-Term Stress & Strain Properties.
4. Able to identify the type of rubber product according the effect of liquids & gases on them.
5. Learn about importance of Pyrolysis test for rubber products.
6. Understand the importance of Creep, Relaxation & Set Properties.
7. Learn about the Stress & Strain Properties.

List of Experiments:

Tutorials/Presentation/Practicals based on above topics

Design based Problems (DP)/Open Ended Problem:

- Rubber Stress-Strain Behavior.
- Uniaxial Extension and Compression in Stress-Strain Relations of Rubber.
- Mechanisms of oxidative degradation. I. Oxidation of synthetic rubbers catalyzed by metallic ions.

- Biochemical Analysis of Rubber Biodegradation.

Major Equipments:
Hardness Tester, Specific gravity balance, Weighing balance, Adhesion Tester, Tensile Tester, Spilt Tear Tester, etc.

List of Open Source Software/learning website:

1. http://files.hanser.de/
2. http://nvlpubs.nist.gov/
3. http://onlinelibrary.wiley.com/
4. http://aem.asm.org/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.